Yoganandh Madhuranthakam

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EDUCATION

PhD in Electrical and Computer Engineering   Jan 2021 – Apr 2025
Michigan State University, East Lansing

- Dissertation: Nonlinear acoustic wave propagation in inhomogeneous media
- Supervisor: Dr. Sunil Kishore Chakrapani | CGPA: 3.75/4.0

Masters in Mechanical Engineering   Aug 2016 – Jun 2018
Indian Institute of Technology (IIT) Hyderabad, Hyderabad

- Dissertation: Prediction of breakout noise from a rectangular duct using SEA and deterministic methods
- Supervisor: Dr. Venkatesham B| CGPA: 9.71/10

RESEARCH EXPERIENCE

Graduate Research Assistant, **Michigan State University** – East Lansing, MI   Jan 2021 – Present

- Devised a novel inversion technique to measure the absolute acoustic nonlinearity parameter β of solids and liquids using a **nonlinear immersion ultrasonic test** with 20% improvement in correlation
- Developed a theoretical framework for capturing the diffraction of a **nonlinear acoustic wave** propagating through n-layer media and validated it with **numerical simulations (k-wave and COMSOL)**
- Performed characterization of surface cracks on a railroad through **ultrasonic flaw detection experiments** and **transient finite element study (FEA)** of Rayleigh wave propagation
- Applied emerging **Physics-Informed Neural Networks (PINN)** to solve nonlinear acoustic wave equations, with hands-on experience using **DEEPXDE**, **PyTorch**, and **TensorFlow** frameworks
- Established a theoretical model to capture the effect of internal stress and dislocations on β in the **nonlinear resonant ultrasound spectroscopy(NRUS)** study of cantilever beam

Graduate Research Assistant, **Indian Institute of Technology (IIT)** – Hyderabad   Aug 2016 – Jun 2018

- Implemented a new emerging **acoustic analysis** technique called **Statistical Energy Analysis (SEA)** in predicting breakout noise from an HVAC duct
- Performed a comparison study between SEA and existing **numerical techniques (FEM/BEM) in COMSOL**

Published and **presented** in **3 peer-reviewed journals** and **3 peer-reviewed conferences**

INDUSTRIAL EXPERIENCE

System Modeling Engineer, Noise Vibration and Harshness (NVH) **Eaton Corporation**,   Aug 2018 – Dec 2020
Pune, India

- Introduced a new approach to calculate **sound radiation (SPL)** from a transmission enclosure (**Gear whine noise**) using **Statistical Energy Analysis (SEA)** and compared results with traditional numerical techniques**(FEM/BEM)**
- Designed and developed a **digital prototype** of a heavy-duty commercial vehicle to conduct **dynamic analysis**, evaluating the impact of clutch, transmission, and differential on **torsional vibrations**
- Developed a high-fidelity dynamic model of a commercial vehicle to simulate **pass-by noise tests (SAE J366, ISO 362)** with an automated process using a MATLAB-based GUI
- Optimized the design of the Inertia Brake for heavy-duty vehicle transmissions, defining critical quality parameters through **mathematical/ physical models and FEA simulations**. Earned **DFSS Green Belt certification**
- Played a crucial role in new product development of **automotive transmission (Eaton - Cummins Endurant), clutch, and differentials** of heavy-duty vehicles through mechanical modeling and design

AWARDS and ACHIEVEMENTS

Fellowship Award, ASNT (American Society for Nondestructive Testing)   2023

Travel Grant Award, Michigan State University College of Engineering   2022, 2023 and 2024

Green Belt in Design for Six Sigma Methods (DFSS), from Eaton Corporation for perform-   2019
ing design optimization of Eaton's automotive product - Inertia Brake

Teaching Assistantship Award, Ministry of Human Resource Development India   2016

TECHNOLOGIES/SKILLS

- **Scripting:** MATLAB, C, C++, Python and LaTex

- **Computational and computer-aided packages:** ANSYS (APDL and Workbench), Comsol, K-wave, Simulink, Mathematica, AMESim, GT - Suite, ESI VA one, and CAD(Solid works and Fusion 360)

- **Experimental:** Contact and immersion transducers, Acoustic imaging (A-scan, B-scan, and C-scan), Signal generator, Gated RF pulse amplifier, Oscilloscope (12 bit, 200 MHz), Transducer calibration, microphones, SPL measurements, Semi anechoic chamber

- **Soft skills:** Problem-solving, Independent research documentation, Time Management, Teamwork

KEYWORDS

Nonlinear ultrasonics and acoustics, Theoretical and experimental acoustics, Ultrasonic testing, Finite Element Analysis (FEA), Mechanical dynamics modeling, Nonlinear resonant ultrasound spectroscopy (NRUS), Nonlinear vibration, CAD/CAM modeling, Experiments, Statistical Energy Analysis (SEA), Nondestructive Evaluation (NDE), Physics-Informed Neural Networks (PINN), Noise Vibration and Harshness (NVH), MATLAB, Python, COMSOL, ANSYS, Solid works, Fusion, Pro-E